List of research activities

2022

CEREA

Atmospheric Environment Center

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Deputy director: Martin Ferrand

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MASSIN Patrick, EDF R&D, Director, PhD, HDR
BOCQUET Marc, École des Ponts ParisTech, Senior Researcher, IGPEF, and Professor, PhD, HDR
FERRAND Martin, EDF R&D, Research Engineer and Lecturer, PhD
SARTELET Karine, École des Ponts ParisTech, Research Scientist, DR1, PhD, HDR
FARCHI Alban, École des Ponts ParisTech, Research Scientist, IPEF, PhD
KIM Youngseob, École des Ponts ParisTech, Research Engineer, PhD
ROUSTAN Yelva, École des Ponts ParisTech, Research Scientist, CRHC, PhD, HDR

Administrative staff

PERIAC Lydie, École des Ponts ParisTech

Engineers

HERARD Jean-Marc, EDF R&D, Senior Researcher, EDF R&D, PhD, HDR
BENHAMADOUCHE Sofiane, EDF R&D, Expert Researcher, PhD, HDR
BONNEL Jérôme, EDF R&D, Expert Researcher
DUPONT Éric, EDF R&D, Expert Researcher
MINIER Jean Pierre, EDF R&D, Expert Researcher
CHARLATCHKA Rayna, EDF R&D, Research Engineer
CHARWATH Marcus, EDF R&D, Research Engineer
CUILHE Benoît, École des Ponts ParisTech, Research Engineer
DEFOSSEZ Arièle EDF R&D, Research Engineer
DEMENGEL Dominique, EDF R&D, Research Engineer
LAB Maxence, École des Ponts ParisTech, Research Engineer
LEFRANC Yannick, EDF R&D, Research engineer
LE GUENNIC Clémentine, EDF R&D, Research engineer
MOURADI REM Sophia, EDF R&D, Research Engineer
NORDDINE Thomas, EDF R&D, Research Engineer
PAYRE Camille, EDF R&D, Research Engineer
QUEMENER Aurélie, École des Ponts ParisTech, Research Engineer
WALD Jean-Francois, EDF R&D, Research Engineer
WALL RIBOT Bénédicte, EDF R&D, Research Engineer
WENDUM Denis, EDF R&D, Research Engineer

Technicians

 FAUCHEUX Aurélien, École des Ponts ParisTech, Technician

Post-doctoral scientists

DUMONT LE BRAZIDEC Joffrey, École des Ponts ParisTech, PhD
DURAND ANTOINE, École des Ponts ParisTech
FINN Tobias, École des Ponts ParisTech, PhD
LANNUQUE Victor, École des Ponts ParisTech
LUGON CORNEJO VON MARTTENS Lya, École des Ponts ParisTech,
NARVAEZ CAMPO Gabriel, École des Ponts ParisTech
PARK Soo-Jin, École des Ponts ParisTech
VANDERBECKEN Pierre, École des Ponts ParisTech, PhD

Emeritus and Associated Researchers

CARISSIMO Bertrand, École des Ponts ParisTech, Senior Researcher and Associate Professor, PhD, HDR
BEAUCHENE Christian, École des Ponts ParisTech, Researcher

Ph.D. students

AMINO GALENTE Hector, EDF R&D, ED SIE
BALVET Guilhem, EDF R&D, ED SIE
BOUNOUAS Hanane, IRSN, École des Ponts ParisTech, ED SIE
DURAND Charlotte, École des Ponts ParisTech, ED SIE
JACQUOT Oscar, École des Ponts ParisTech, ED SIE
JOSE Jerry, École des Ponts ParisTech, ED SIE
LADET Daphné, Total, École des Ponts ParisTech, ED SIE
LANNES Marjolaine École des Ponts ParisTech, ED SIE
LAUNAY Émilie, LCPP, École des Ponts ParisTech, ED SIE
LETOURNEL Pierre, CEA, École des Ponts ParisTech, ED SIE
MAISON Alice, École des Ponts ParisTech, ED SIE
SARICA Thibaud, École des Ponts ParisTech, ED SIE
SQUARCIONI Alexis, École des Ponts ParisTech, ED SIE
WANG Yunyi, École des Ponts ParisTech, EDF R&D, ED SIE
WANG Zhizhao, École des Ponts ParisTech, ED SIE

Interns

LESGUILLONS Max, École des Ponts ParisTech
PENNEL Romain, EDF R&D
RUGET Simon, EDF R&D

Published articles in peer-reviewed international journals

1. **Q. Malartic, A. Farchi,** and **M. Bocquet**, "State, global, and local parameter estimation using local ensemble Kalman filters: Applications to online machine learning of chaotic dynamics," *Q. J. R. Meteorol. Soc.*, vol. 148, pp. 2167–2193, 2022, doi: 10.1002/qj.4297.

2. C. Grudzien and **M. Bocquet**, "A fast, single-iteration ensemble Kalman smoother for sequential data assimilation," *Geosci. Model Dev.*, vol. 15, pp. 7641–7681, 2022, doi: 10.5194/gmd-15-7641-2022.

3. V. Guérin, **A. Farchi**, F. Cawez, P. Mercuri, P. Lucas, Y. Blanchard, M. Saulmont, J. Mainil, and D. Thiry, "A three-year evolution and comparison of the bla$_{CTX-M}$ genes in pathogenic and non-pathogenic Escherichia coli isolated from young diarrheic and septicaemic calves in Belgium," Research in Veterinary Science, vol. 152, pp. 647–650, 2022, doi: 10.1016/j.rvsc.2022.09.037.

4. V. Guérin, **A. Farchi**, D. Thiry, F. Cawez, P.S. Mercuri, M. Galleni, J. Mainil, and M. Saulmont, "Seven-Year Evolution of β-Lactam Resistance Phenotypes in Escherichia coli Isolated from Young Diarrheic and Septicaemic Calves in Belgium," *Veterinary Sciences*, vol. 9, p. 45, 2022, doi: 10.3390/vetsci9020045.

5. **L. Al Asmar, L. Musson-Genon, E. Dupont, M. Ferrand**, and **K. Sartelet**, "Modeling the contribution of Aerosols to Fog Evolution through Their Influence on Solar Radiation", *Climate*, vol. 10, p. 61, 2022, doi: 10.3390/cli10050061.

6. **Z. Wang**, F. Couvidat and **K. Sartelet**, "GENerator of reduced Organic Aerosol mechanism (GENOA v1.0): an automatic generation tool of semi-explicit mechanisms", *Geosci. Model Dev.*, vol 15, p. 8957-8982, 2022, doi:10.5194/gmd-15-8957-2022.

7. **Y. Kim, L. Lugon, A. Maison, T. Sarica, Y. Roustan**, M. Valari, Y. Zhang, M. André and **K. Sartelet**, "MUNICH v2.0: a street-network model coupled with SSH-aerosol (v1.2) for multi-pollutant modelling", *Geosci. Model Dev.*, vol 15, p.7371-7396, 2022, doi:10.5194/gmd-15-7371-2022.

8. **A. Maison**, C. Flageul, **B. Carissimo, Y. Wang,** A. Tuzet and **K. Sartelet**, "Parameterizing the aerodynamic effect of trees in street canyons for the street network model MUNICH using the CFD model Code_Saturne", *Atmos. Chem. Phys.*, vol 22, p.9369-9388, 2022, doi:10.5194/acp-22-9369-2022.

9. G. Foret, V. Michoud, S. Kotthaus, J.-E. Petit, A. Baudic, G. Siour, **Y. Kim**, J.-F. Doussin, J.-C. Dupont, P. Formenti, C. Gaimoz, V. Ghersi, A. Gratien, V. Gros, J.-L. Jaffrezo, M. Haeffelin, M. Kreitz, F. Ravetta, **K. Sartelet**, L. Simon, Y. Té, G. Uzu, S. Zhang, O. Favez, M. Beekmann, "The December 2016 extreme weather and particulate matter pollution episode in the Paris region (France)", *Atmos. Environ.*, vol. 291, 119386, 2022, doi: 10.1016/j.atmosenv.2022.119386.

10. B. Thera, P. Dominutti, A. Colomb, V. Michoud, J.-F. Doussin, M. Beekmann, F. Dulac, **K. Sartelet**, A. Borbon, "O3-NOy photochemistry in boundary layer polluted plumes: insights from the MEGAPOLI (Paris), ChArMEx/SAFMED (North West Mediterranean) and DACCIWA (southern West Africa) aircraft campaigns", *Environ. Sci.: Atmos.*, vol. 2, p. 659-686, doi:10.1039/D1EA00093D.

11. **K. Sartelet, Y.,Kim**, F. Couvidat, M. Merkel, T. Petäjä, J. Sciare and A. Wiedensohler, "Influence of emission size distribution and nucleation on number concentrations over Greater Paris", *Atmos. Chem. Phys.*, vol. 22, p. 8579-8596, 2022, doi:10.5194/acp-22-8579-2022.

12. B. Marques, E. Kostenidou, A.M. Valiente, B. Vansevenant, **T. Sarica**, L. Fine, B. Temime-Roussel, P. Tassel, P. Perret, Y. Liu, **K. Sartelet**, C. Ferronato, B. D'Anna, "Detailed Speciation of Non-Methane Volatile Organic Compounds in Exhaust Emissions from Diesel and Gasoline Euro 5 Vehicles Using Online and Offline Measurements", *Toxics*, vol. 10, p.184, 2022, doi:10.3390/toxics10040184.

13. **L. Lugon, Y. Kim**, J. Vigneron, O. Chrétien, M. André, J.-M. André, S. Moukhtar, M. Redaelli and **K. Sartelet**, "Effect of vehicle fleet composition and mobility on outdoor population exposure: A street resolution analysis in Paris", *Atmospheric Pollution Research*, Vol. 13, 101365, 2022, doi: 10.1016/j.apr.2022.101365.

14. **A. Maison**, C. Flageul, **B. Carissimo**, A. Tuzet and **K. Sartelet**, "Parametrization of Horizontal and Vertical Transfers for the Street-Network Model MUNICH Using the CFD Model Code_Saturne", *Atmosphere*, Vol. 13, 527, 2022, doi: 10.3390/atmos13040527.

15. T. Wang, J. Li, J. Pan, D. Ji, **Y. Kim**, L. Wu, X. Wang, X. Pan, Y. Sun, Z. Wang, W. Yang, H. Du , "An integrated air quality modeling system coupling regional-urban and street models in Beijing", *Urban Climate,* Vol. 43, 101143, 2022, doi:10.1016/j.uclim.2022.101143.

16. S. Tsyro, W. Aas, A. Colette, C. Andersson, B. Bessagnet, G. Ciarelli, F. Couvidat, K. Cuvelier, A. Manders, K. Mar, M. Mircea, N. Otero, M.-T. Pay, **V. Raffort, Y. Roustan**, M. R. Theobald, M. G. Vivanco, H. Fagerli, P. Wind, G. Briganti, A. Cappelletti, M. D'Isidoro, and M. Adani, "Eurodelta multi-model simulated and observed particulate matter trends in Europe in the period of 1990–2010", Atmos. Chem. Phys., 22, 7207–7257, 2022, doi : 10.5194/acp-22-7207-2022.

17. J. Jose, A. Gires, I. Tchiguirinskaia, **Y. Roustan**, D. Schertzer, "Scale invariant relationship between rainfall kinetic energy and intensity in Paris region: An evaluation using universal multifractal framework", Journal of Hydrology, Volume 609, 127715, 2022, doi : 10.1016/j.jhydrol.2022.127715.

18. **H. Amino**, C. Flageul, **S. Benhamadouche**, I. Tiselj, **B. Carissimo**, and **M. Ferrand**, "A time-staggered second order conservative time scheme for variable density flow," International Journal for Numerical Methods in Fluids, vol. 94, no. 12, pp. 1964–1995, 2022.

19. T. Nagel, R. Schoetter, V. Masson, C. Lac, and **B. Carissimo**, "Numerical analysis of the atmospheric boundary-layer turbulence influence on microscale transport of pollutant in an idealized urban environment," Boundary-Layer Meteorology, vol. 184, no. 1, pp. 113–141, 2022. doi: 10.1007/s10546-022-00697-7.

Peer-reviewed chapters and proceedings

1. A. Carrassi, **M. Bocquet**, J. Demaeyer, C. Gruzien, P. N. Raanes, and S. Vannitsem, "Data assimilation for chaotic dynamics," in *Data Assimilation for Atmospheric, Oceanic and Hydrologic Applications (Vol. IV)*, S. K. Park and L. Xu, Eds. Springer, Cham, 2022, pp. 1–42. doi: 10.1007/978-3-030-77722-7_1.

2. **K. Sartelet**, "Secondary Aerosol Formation and Their Modeling", In: *Dulac, F., Sauvage, S., Hamonou, E. (eds) Atmospheric Chemistry in the Mediterranean Region,* Springer, Cham., p. 165-183, 2022, doi: 10.1007/978-3-030-82385-6_10

3. F. Dulac, E. Hamonou, S. Sauvage, M. Kanakidou, M. Beekmann, K. Desboeufs, P. Formenti, S. Becagli, C. di Biagio, A. Borbon, C. Denjean, F. Gheusi, V. Gros, C. Guieu, W. Junkermann, N. Kalivitis, B. Laurent, M. Mallet, V. Michoud, P. Nabat, **K. Sartelet** and K. Sellegri, "Summary of Recent Progress and Recommendations for Future Research Regarding Air Pollution Sources, Processes, and Impacts in the Mediterranean Region", In: *Dulac, F., Sauvage, S., Hamonou, E. (eds) Atmospheric Chemistry in the Mediterranean Region,* Springer, Cham., p. 543-571, 2022, doi: 10.1007/978-3-030-82385-6_25

4. **T. Sarica, K. Sartelet, Y. Roustan, Y. Kim, L. Lugon**, M. André, B. Marques, B. D'Anna, C. Chaillou, C. Larrieu, "Modelling Pollutant Concentrations in Streets: A Sensitivity Analysis to Asphalt and Traffic Related Emissions". In: *Mensink, C., Jorba, O. (eds) Air Pollution Modeling and its Application XXVIII. ITM 2021,* Springer Proceedings in Complexity. Springer, Cham, doi:10.1007/978-3-031-12786-1_39

Non-peer-reviewed chapters and proceedings

1. **E. Launay**, V. Hergault, **M. Bocquet, J. Dumont Le Brazidec**, L. Sadeq and **Y. Roustan,** "Source characterisation of large-scale urban fires by inverse modelling", 21st International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, HARMO 2022.

2. **H. Bounouas**, P. Roupsard, **E. Dupont, Y. Roustan**, J. Chardeur, O. Connan, D. Hebert, P. Laguionie, D. Maro, H. Renard, M. Rozet, **T. Regi, B. Carissimo, A. Faucheux** and **Y. Lefranc**, "Study of atmospheric dispersion under low wind conditions in an urban environment, first results**"** 21st International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, HARMO 2022.

3. **A. Maison, Y. Kim, K. Sartelet,** "Modelling the impacts of urban trees on air quality in streets." 21st International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, HARMO 2022.

4. **Y. Wang,** C. Flageul, C. Lin, R. Ooka, H. Kikumoto, **Y. Kim, K. Sartelet, "**Simulations of street-canyon air-quality using fluid dynamics and aerosol modelling." 21st International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes, HARMO 2022.

International conference oral presentations

1. **M. Bocquet, et al.** *Using machine learning in geophysical data assimilation.* MFO Workshop, Data Assimilation – Mathematical Foundation and Applications. Oberwolfach, Germany. February 20-26, 2022. [invited, online.]

2. A. Carrassi, J. Amezcua, D. Ayers, L. Bertino, **M. Bocquet**, J. Brajard, Y. Chen, S. Driscoll, **C. Durand, A. Farchi, T. Finn**, C. Jones, V. Ohija, E. Olason, and I. Pasmans. *Using machine learning in geophysical data assimilation*, MFO Workshop: Data Assimilation – Mathematical Foundation and Applications. Oberwolfach, Germany. February 24, 2022. [invited, online]

3. **M. Bocquet.** *Discussion panel WCRP meeting: Data Assimilation Needs for Climate Prediction.* Boulder, Colorado, USA. May 17-18, 2022. [invited, online]

4. C. Grudzien, C. and **M. Bocquet.** *A fast, single-iteration ensemble Kalman smoother for sequential data assimilation.* EGU General Assembly 2022. Vienna, Austria. May 23-27, 2022.

5. **P. Vanderbecken, A. Farchi, M. Bocquet, J. Dumont Le Brazidec, Y. Roustan,** G. Broquet, and É. Potier. *Comparison of non-local metrics towards the assimilation of pollutant plumes without the double penalty.* EGU General Assembly 2022. Vienna, Austria. May 23-27, 2022. [online]

6. **J. Dumont Le Brazidec, M. Bocquet,** O. Saunier, and **Y. Roustan.** *Integrating measurement representativeness and release temporal variability to improve the Fukushima-Daiichi Cs-137 source reconstruction.* EGU General Assembly 2022. Vienna, Austria. May 23-27, 2022. [online]

7. **A. Farchi,** M. Chrust, **M. Bocquet,** P. Laloyaux, M. Bonavita, and **Q. Malartic.** *Model error correction with data assimilation and machine learning.* EGU General Assembly 2022. Vienna, Austria. May 23-27, 2022. [online]

8. **T. Finn, G.** Geppert, and A. Ament. *Fingerprint operators for coupled data assimilation of screen-level observations across the atmosphere-land interface.* EGU General Assembly 2022. Vienna, Austria. May 23-27, 2022. [invited, online]

9. **T. Finn, C. Durand, A. Farchi, M. Bocquet,** Y. Chen, A. Carrassi, and V. Dansereau. *Learning and screening of neural networks architectures for sub-grid-scale parametrizations of sea-ice dynamics from idealized twin experiments.* EGU General Assembly 2022. Vienna, Austria. May 23-27, 2022. [online]

10. **T. Finn, C. Durand, A. Farchi, M. Bocquet,** Y. Chen, A. Carrassi, and V. Dansereau. *Learning and screening of neural networks architectures for sub-grid-scale parametrizations of sea-ice dynamics from idealized twin experiments.* Data assimilation and machine learning for the Earth system - Living planet symposium. Bonn, Germany. May 23-27, 2022.

11. **M. Bocquet, A. Farchi, Q. Malartic**, M. Bonavita, P. Laloyaux and M. Chrust. *Online algorithms for learning data-driven models of chaotic dynamics.* The International EnKF Workshop 2022. Balestrand, Norway. May 30-June 2, 2022.

12. **J. Dumont Le Brazidec, M. Bocquet,** O. Saunier, O.**,** and **Y. Roustan.** *Integrating measurement representativeness and release temporal variability to improve the Fukushima-Daiichi Cs-137 source reconstruction.* The International EnKF Workshop 2022. Balestrand, Norway. May 30 - June 2, 2022. [online]

13. **M. Bocquet** et al. *Combining data assimilation and machine learning to build data-driven models of chaotic dynamics.* AGCI Workshop on Machine Learning and Climate Science in Aspen, CO. Aspen, Colorado, USA. June 5-10, 2022. [invited]

14. **T. Finn, C. Durand, A. Farchi, M. Bocquet,** Y. Chen, A. Carrassi, and V. Dansereau. *Learning and screening of neural networks architectures for sub-grid-scale parametrizations of sea-ice dynamics from idealized twin experiments.* Workshop: Machine Learning for Polar Regions at Columbia University. June 17, 2022. [online]

15. S. Driscoll, A. Carrassi, **M. Bocquet**, L. Bertino, J. Brajard, and E. Ólason. *Sensitivity analysis and machine learning to learn a melt pond parametrisation.* ICSS/MLDADS workshop. Imperial College, London, UK. June 23, 2022.

16. **Bocquet, M** et al. *Combining data assimilation and machine learning to build data-driven models of chaotic dynamics.* Keynote seminar in the STUOD Sand-box, Online event. June 24, 2022. [invited, online]

17. **M. Bocquet** et al. *Combining machine learning and data assimilation to learn dynamics from sparse and noisy observations.* Data Science Symposium at Hereon, Geesthacht, Germany. June 27-28, 2022. [invited, online]

18. A. Carrassi, J. Amezcua, D. Ayers, L. Bertino, **M. Bocquet**, J. Brajard, Y. Chen, S. Driscoll, C. K. R. T. Jones, V. Ohija., E. Ólason, and I. Pasmans. *Using machine learning in geophysical data assimilation: some of the issues and some ideas.* Workshop - AI in complex fluids. Rome, Italy. July 6, 2022. [invited]

19. **M. Bocquet**, **O. Jacquot, A. Farchi,** and **K. Sartelet.** *Machine learning and the geosciences, Focus on surrogate modelling Basic of Machine Learning for experimental science*s, Université Paris Cité. Paris, France. July 12-13, 2022. [invited]

20. **J. Dumont Le Brazidec, P. Vanderbecken, A. Farchi, Y. Roustan,** and **M. Bocquet,** *CO2 plume detection using deep learning and simulated XCO2 fields.* IWGGMS-18. July 12-14, 2022. [online]

21. **P. Vanderbecken, J. Dumont Le Brazidec, A. Farchi, M. Bocquet, Y. Roustan,** É. Potier, and G. Broquet**,** *Non-local metrics applied to the comparison of CO2 plumes and their sensivities to mesoscale meteorology.* IWGGMS-18. July 12-14, 2022. [online]

22. J. Brajard, S. Barthélémy, L. Bertino, **M. Bocquet**, A. Carrassi, and **A. Farchi.** *Improving numerical models by integrating observations Achievements and challenges Andiamo workshop, Sorbonne Université.* Paris, France. September 8, 2022. [invited]

23. **A. Farchi**, **M. Bocquet**, P. Laloyaux, and M. Bonavita *Using machine learning to correct model error in data assimilation and forecast applications.* LEAP ML Climate journal club. Columbia University. September 19, 2022. [invited, online]

24. **M. Bocquet**, **A. Farchi, Q. Malartic**, M. Bonavita, P. Laloyaux, and M. Chrust. *Bayesian online algorithms for learning data-driven models of chaotic dynamics.* Joint Meeting - Inverse Problems: From experimental data to models and back. University of Potsdam, Postdam, Germany. September 19-21, 2022. [invited, keynote speaker]

25. **T. Finn.** T*he Self-Attentive Ensemble Transformer: Representing Ensemble Interactions in Neural Networks for Earth System Models.* Transformers for environmental science. Magdeburg, Germany. September 22-23, 2022 [online]

26. **E. Launay,** V. Hergault**, M. Bocquet, J. Dumont Le Brazidec, Y. Roustan.** *Source characterisation of large-scale urban fires by inverse modelling.* Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Aveiro, Portugal. September 27-30, 2022.

27. **J. Dumont Le Brazidec, P. Vanderbecken, A. Farchi, M. Bocquet.** *CO2 plume detection using deep neural networks and simulated XCO2 fields.* Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Aveiro, Portugal. September 27-30, 2022.

28. **M. Ferrand, K. Kuznetsov, B. Carrissimo,** and **M. Bocquet.** *MCMC Metropolis-Hastings algorithm in the source inversion problems of air pollutants in urban CFD modelling.* Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Aveiro, Portugal. September 27-30, 2022.

29. **M. Bocquet, A. Farchi, Q. Malartic**, M. Bonavita, P. Laloyaux, and M. Chrust. *Beyond one iteration of machine learning and data assimilation steps for learning meteorological models ECMWF–ESA Workshop on Machine Learning for* Earth Observation and Prediction. Reading, UK. November 14-17, 2022.

30. **A. Farchi,** M. Chrust, **M. Bocquet,** P. Laloyaux, and M. Bonavita. *Online model error correction with neural networks – Towards an implementation in the ECMWF data assimilation system.* ECMWF–ESA Workshop on Machine Learning for Earth Observation and Prediction. Reading, UK. November 14-17, 2022.

31. **M. Bocquet** et al. *What does AI bring to forecasting in the geosciences? Session AI for Disaster Risk Assessment.* The 3rd Japanese-German-French AI Symposium − AI for Planetary Challenges in the Anthropocene. Tokyo, Japan. October 27-28, 2022. [invited]

32. S. Driscoll, A. Carrassi, **M. Bocquet**, L. Bertino J. Brajard, and E. Ólason. *Sensitivity Analysis and Machine Learning of a Sea Ice Model and its Melt Pond Parametrisation.* AGU Fall meeting, NG16A - Data-Driven Subgrid-Scale Parameterizations for Earth System Modeling. Chicago, USA. December 12, 2022.

33. **A. Maison, Y. Kim, K. Sartelet.** *Modelling the impacts of urban trees on air quality in streets.* Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Aveiro, Portugal. September 27-30, 2022.

34. **Y. Wang,** C. Flageul, C. Lin, R. Ooka, H. Kikumoto, **Y. Kim, K. Sartelet.** *Simulations of street-canyon air-quality using fluid dynamics and aerosol modelling.* Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Aveiro, Portugal. September 27-30, 2022.

35. C. Lin, **Y. Wang,** R. Ooka, C. Flageul, **Y. Kim,** H. Kikumoto, **Z. Wang, K. Sartelet**. *Modelling of street-scale reactive pollutant dispersion and evaluation of mitigation countermeasure.* Paris Olympics RDP General Assembly, Paris, France November 28-30, 2022.

36. **L. Lugon, A. Squarcioni,** M. Valari, **Y. Roustan, K. Sartelet**. *Multi-scale air-quality modelling down to the street scale.* Paris Olympics RDP General Assembly, Paris, France November 28-30, 2022.

37. **A. Maison, K. Sartelet**, A. Tuzet, **Y. Kim**. *Impact of trees on local air quality.* Paris Olympics RDP General Assembly, Paris, France November 28-30, 2022.

38. **K. Sartelet**, G. Hoek, *Urban mapping*, RI-Urbans 1st Science Meeting, Barcelona, Spain, October 19-20, 2022.

39. **H. Amino**, C. Flageul, **B. Carissimo, M. Ferrand, and J.-M. Hérard**, *A TIME-STAGGERED SECOND ORDER SCHEME FOR MOIST AIR VARIABLE DENSITY FLOW*, European Congress on Computational Methods in Applied Sciences and Engineering, 2022.

40. **H. Amino,** C. Flageul, **B. Carissimo, M. Ferrand,** *A time-staggered CFD scheme for variable density moist air Flow*, ECCOMAS Congress 2022-8th European Congress on Computational Methods in Applied Sciences and Engineering, Oslo, Norway, June 5 – 9, 2022.

41. **M. Ferrand**, Z. Dong, D. Violeau, *Boundary integral approach for axisymmetric SPH*, 16th SPHERIC International Workshop, Catania, Italy, June 2022.

International conference poster presentations

1. S. Driscoll, A. Carrassi, L. Bertino, J. Brajard, **M. Bocquet**, and E. Ólason. *Sensitivity Analysis and Machine Learning of a Sea Ice Model and its Melt Pond Parametrisation.* INI Satellite programme, Geophysical fluid dynamics; from mathematical theory to operational prediction. Reading, UK. August 30, 2022.

2. **J. Dumont Le Brazidec, P. Vanderbecken, A. Farchi,** and **M. Bocquet.** *CO_2 plume detection using deep neural networks and simulated XCO_2 fields.* ICOS Science Conference. Utrecht, Netherlands, Septembre 13-15, 2022. [online]

3. **T. Finn, C. Durand, A. Farchi, M. Bocquet,** Y. Chen, A. Carrassi, and V. Dansereau. *Deep learning of subgrid-scale parametrisations for sea-ice dynamics in a Maxwell-Elasto-Brittle rheology.* SIP Follow on: Mathematics of sea ice in the twenty-first century. Isaac Newton Institute. Cambridge, UK. September 19-23, 2022

4. **J. Dumont Le Brazidec, M. Bocquet,** O. Saunier, and **Y. Roustan.** *Integrating measurement representativeness and release temporal variability to improve the Fukushima-Daiichi Cs-137 source reconstruction.* Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Aveiro, Portugal. September 27-30, 2022.

5. **P. Vanderbecken, J. Dumont Le Brazidec, A. Farchi, M. Bocquet, Y. Roustan**, É. Potier, and G. Broquet, *Non-local metrics applied to the comparison of CO2 plumes and their sensitivities to mesoscale meteorology.* Sentinel-5P Mission: 5 years Anniversary. Taormina, Italy. October 10-14, 2022.

6. **J. Dumont Le Brazidec, P. Vanderbecken, A. Farchi, Y. Roustan, M. Bocquet,** et al. *CO2 plume detection using deep neural networks and simulated XCO2 fields.* Sentinel-5P Mission: 5 years Anniversary. Taormina, Italy. October, 10-14, 2022.

7. S. Driscoll, A. Carrassi, **M. Bocquet**, L. Bertino, J. Brajard, and E. Ólason. *Sensitivity Analysis and Machine Learning of a Sea Ice Model and its Melt Pond Parametrisation.* Reading, UK. November 14-17, 2022.

8. **T. Finn, C. Durand, A. Farchi, M. Bocquet,** Y. Chen, A. Carrassi, and V. Dansereau. *Deep learning of subgrid-scale parametrisations for sea-ice dynamics in a Maxwell-Elasto-Brittle rheology.* ECMWF–ESA Workshop on Machine Learning for Earth Observation and Prediction, Reading, ECMWF, UK. November 14-17, 2022.

9. **H. Bounouas**, P. Roupsard, **E. Dupont**, and **Y. Roustan**, *Study of atmospheric dispersion under low wind speed conditions in an urban environment, first results*. Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Aveiro, Portugal. September 27-30, 2022.

10. **M. Diallo, Y. Roustan,** and **E. Dupont**, Combining SAR 10m wind speed estimates and a 14 ensemble of WRF meteorological forecast for improved offshore site wind mapping at wind turbine hub height. WindEurope Technology Workshop, 23-24 June 2022, Brussels, Belgium.

11. **Z. Wang**, F. Couvidat, **K. Sartelet**, Reduction strategies for the automatic generation of SOA mechanism using GENOA. Atmospheric Chemical Mechanisms Conference, UC Davis, USA, December 7 - 9, 2022.

12. **Z. Wang**, F. Couvidat, **K. Sartelet**, Semi-explicit Monoterpene - SOA chemical mechanisms for regional-scale modeling, 11th International Aerosol Conference, Athens, Greece, September 4-9, 2022.

13. **G. Balvet, M. Ferrand, Y. Roustan, J.-P. Minier,** C. Henry**.** *Treatment of the near ground effect in Lagrangian stochastic methods applied to a 2-D point source dispersion after an isolated obstacle in a neutral flow.* Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Aveiro, Portugal. September 27-30, 2022.

14. **B. Cuilhe, M. Ferrand, Y. Roustan, B. Carissimo.** *Analyse of the buoyancy approximation on the velocity scaling of CFD precomputed wind database for atmospheric dispersion modelling.* Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Aveiro, Portugal. September 27-30, 2022.

15. **A. Défossez, R. Charlatchka.** *State of the art on deposition by fog and their differences with respect to dry (washing by rain) and wet deposition for a better representation in impact studies.* Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes. Aveiro, Portugal. September 27-30, 2022.

16. Baptiste Amiot, Sylvain Edouard, Rémi Le Berre, Mike Van Iseghem, **Martin Ferrand**, Javier Vidal-Hurtado, Stéphanie Giroux—Julien, Didier Combes, *How Agrivoltaics and Floating Photovoltaics Influence Evapo-Transpi-Ration?*, 8th World Congress on Photovoltaic Energy Conversion, Milano, Italy, September 2022.

National conference oral presentations

1. **J. Dumont Le Brazidec, A. Farchi, P. Vanderbecken, Y. Roustan, M. Bocquet,** et al. *CO2 plume detection using deep neural networks and simulated XCO2 field.* Journée SAMA IPSL. Paris, France. April 11, 2022.

2. **P. Vanderbecken, J. Dumont Le Brazidec, A. Farchi, Y. Roustan, M. Bocquet**, É. Potier, and G. Broquet. *Metrics and optimal transport towards urban plume data assimilation.* Journée SAMA IPSL. Paris, France. April 11, 2022.

3. **J. Dumont Le Brazidec, A. Farchi, P. Vanderbecken, Y. Roustan, M. Bocquet,** J. Lian, G. Broquet, T. Lauvaux, and A. Danjou. *CO2 plume detection using deep neural networks and simulated XCO2 fields.* Journée RESSTE, Paris, France. May 10, 2022

4. **M. Bocquet**, and J. Brajard. *Machine Learning and Data Assimilation.* IPSL-CSG virtual school — Climate Change: Challenges and issues in Data Science. Paris, France. May 17, 2022. [invited, online]

5. **A. Farchi**. *Data Assimilation for the geosciences, an overview.* IPSL-CSG virtual school — Climate Change: Challenges and issues in Data Science. Paris, France. May 17, 2022. [invited, online]

6. **Z. Wang**, F. Couvidat, **K. Sartelet**, *Développement de mécanismes chimiques semi-explicites pour la modélisation de la formation d'aérosols organiques secondaires des sesquiterpènes.* 35ème Congrès Français sur les Aérosols, Paris, France, May 9 and 10, 2022.

7. G. Uzu, **K. Sartelet**, *Pollution atmosphérique urbaine et santé, verrous/défis*, Colloque National de Chimie Atmosphérique, Reims, France, May 9-11, 2022 [invited]

8. **K. Sartelet**, *Carbone suie à l'échelle urbaine, modélisation et incertitudes.* Rencontres du GRD Suie, Mulhouse, France, October 6-7, 2022. [invited]

9. B. Amiot, **M. Ferrand**, R. Le Berre, S. Giroux, Hétérogénéité des modes de transferts convectifs au sein des centrales solaires photovoltaïques, June 2022, DOI: 10.25855/SFT2022-047, 30ème congrès annuel de la Société Française de Thermique, Valenciennes, France.

10. **Y. Roustan**, Que peut-on attendre de la modélisation de la qualité de l'air? 2ème colloque de sciences appliquées au sapeur pompier, Paris, France, May 3-4, 2022. [invited]

Summer/winter schools

- **M. Bocquet.** *Hybrid methods: the best of ensemble Kalman filters and variational methods?* Short course on data assimilation, organised by Haroldo Fraga de Campos Velho and Fangxin Fang, the Imperial College. London, UK. July 13, 2022. [invited, online]

- **C. Durand, T. Finn, A. Farchi, M. Bocquet,** and A. Carrassi. *ML-based emulators of sea-ice models.* Institute of Computing for Climate Science Summer School 2022. Cambridge, UK. September 20, 2022.

- **K. Sartelet**, *Modélisation: chimie atmosphérique*, Formation "Les composés organiques biogéniques volatils (COVB): processus, émissions, devenir et impacts", INRAE, Grignon, France, September 22-23, 2022. [invited]

Committee activities

Editorial boards

- **M. Bocquet,** Associate Editor, "Quarterly Journal of the Royal Meteorological Society".

- **M. Bocquet,** Associate Editor, "Foundations of Data Science", journal of the AIMS.

- **M. Bocquet,** Guest Editor, for the special collection *Combined machine learning and data assimilation for the atmosphere and ocean sciences* in "Quarterly Journal of the Royal Meteorological Society".

- **M. Bocquet,** Associate Editor for the topic *Dynamical Systems* in "Frontiers in Applied Mathematics and Statistics".

- **K. Sartelet**, Editor for the special issue *Air quality research at street level*, inter-journal "Atmos. Chem. Phys." and "Geosci. Mod. Dev.".

- **K. Sartelet,** Editorial board for the journal "Atmosphere".

Conference organisation

- J. Brajard, **M. Bocquet,** P. Dueben, and V. Eyring. Co-organisation of the session: Data assimilation and machine learning for the Earth system - Living planet symposium. Bonn, Germany. May 23-27, 2022.

- **M. Bocquet,** et al. Scientific Committee of the ECMWF–ESA Workshop on Machine Learning for Earth Observation and Prediction. Reading, UK. November 14-17, 2022.

- **B. Carissimo,** Steering Committee of the 21st International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes (HARMO21), Aveiro Portugal, September 27-30, 2022.

Conference session chairing

- **A. Farchi** and M. Chrust. Session chairs of *Session 2.3 Hybrid Data Assimilation – Machine Learning and Machine Learning at the edge.* ECMWF–ESA Workshop on Machine Learning for Earth Observation and Prediction. Reading, UK. November 14-17, 2022.

- **M. Bocquet** and M. Chrust. Session chairs of *Session 3.1 Machine Learning for Model emulation and Model discovery.* ECMWF–ESA Workshop on Machine Learning for Earth Observation and Prediction. Reading, UK. November 14-17, 2022.

- B. Le Saux and **T. Finn**. Session chairs of *Session 4.2 Machine Learning for user-oriented Earth Science applications.* ECMWF–ESA Workshop on Machine Learning for Earth Observation and Prediction. Reading, UK. November 14-17, 2022.

- **K. Sartelet**. Chair of session "Aérosols atmosphériques", 35ème Congrès Français sur les Aérosols, Paris, France, May 9-10, 2022.

- **K. Sartelet**. Chair of session 'Air Quality', Paris Olympics RDP General Assembly, Paris, France November 28-30, 2022.

- **B. Carissimo** Chair of the session 'Modelling air dispersion and exposure to accidental releases' in 21st International conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes (HARMO21), Aveiro Portugal, September 27-30, 2022.

Scientific committees

- **M. Bocquet,** Scientific committee, European Center for Scientific Computing (CERFACS).

- **M. Bocquet**, Prix André Prud'Homme Committee of the Meteorology and Climate Society.

- **M. Bocquet**, Bureau member of SAMA (Statistique pour l'Analyse, la Modélisation et l'Assimilation) of Institut Pierre-Simon Laplace Institute (IPSL).

- **M. Bocquet,** Membre du conseil scientifique du GdR "Défis théoriques pour les sciences du climat"

- **E. Dupont**, member of the Scientific Committee of "Site instrumental de recherche par télédétection atmosphérique" (SIRTA).

- **K. Sartelet**, member of the Scientific Committe "Arbres et climat", Ville de Paris.

- J. Cuesta, V. Gros, **K. Sartelet**, co-Chair of the IPSL theme on Atmospheric Composition and Air Quality

- A. Elessa Etuman, **L. Lugon**, L. Marelle, **K. Sartelet**, M. Valari, animation of the IPSL working group on Atmospheric Composition Modelling

- **K. Sartelet,** Member of the OSU-EFLUVE board as representative of the college A called "university professors and assimilated personnel ».

- **Y. Roustan,** Member of the OSU-EFLUVE board.

- **Y. Roustan,** Member of the OSU-EFLUVE scientific committee.

- **B. Carissimo** Scientific Committe of the 21st International Conference on Harmonisation within Atmospheric Dispersion Modelling for Regulatory Purposes (HARMO21)

Thesis committees

- **M. Bocquet**, PhD advisor, PhD, Joffrey Dumont Le Brazidec, "Inférence bayésienne et quantification d'incertitudes pour l'estimation de sources de rejets de radionucléides". École des Ponts ParisTech. March 29, 2021.

- **M. Bocquet**, Referee, PhD, Nishant KUMAR, "Data-Driven Flow Modelling Using Machine Learning and Data Assimilation". Université de Poitiers, France. September 8, 2021.

- **K. Sartelet**, Examiner and president, PhD, Alexandre Danjou, "Space-borne CO2 emissions estimates for fast-growing cities, University Paris-Saclay, France, December 13, 2022.

- **K. Sartelet**, Examiner, Kawssar.M. Haider, PhD, "Role of the organic waste products reactivity in secondary organic aerosol formation.", University of Lille, France, December 9, 2022.

- **Y. Roustan**, Referee, PhD, Thomas Audoux, "Approches expérimentales pour l'étude et la caractérisation des dépôts humides d'aérosols atmosphériques par les précipitations". Université Paris Cité, France. December 12, 2022.

- **Y. Roustan**, Referee, PhD, Medhi Slimani, "Validation numérique et expérimentale d'une approche de modélisation lagrangienne à réponse rapide pour des rejets de substances dangereuses en milieu industriel ou urbain. ". INSA Lyon, France. December 5, 2022.

- **B. Carissimo and M. Ferrand**, PhD advisors, PhD, Hector Amino Galente, "Development of a CFD time scheme for indoor airflow applications". École des Ponts ParisTech. March 29, 2021.

Teaching

École des Ponts and affiliated masters

- **M. Bocquet** and **A. Farchi.** Introduction to Data Assimilation, Master MOCIS et WAPE Num2.2 and ADOMO (École des Ponts ParisTech)

- **K. Sartelet**, (teaching, responsible) 2nd year ENPC courses on "Atmospheric Environment and Air Quality" ("Ville Environnement Transport" Department, 13 x 2.5 hours)).

- **K. Sartelet**, (teaching) course on "Urban Air Quality" in the 2nd year set of courses on "Challenges, science and tools for the transition of cities and territories" ("Ville Environnement Transport" Department, 2.5 hours).

- **K. Sartelet**, (teaching) Modélisation numérique des particules, M2 AIR du master Risque et Environnement, parcours Sciences et Génies de l'Environnement (Université de Paris - Université Paris Est Créteil – École des Ponts ParisTech, 3 hours).

- **M. Ferrand**, (teaching) Mécanique des fluides incompressibles - 1 (2ème année Ecole des Ponts, 6x3-hour lectures).

- **M. Ferrand**, (teaching) Mécanique des fluides incompressibles - 2 (2ème année Ecole des Ponts, 6x3-hour lectures).

- **M. Ferrand**, (responsible and teaching) Simulation numérique de l'aéraulique et de la qualité de l'air en milieu urbain (2ème année Ecole des Ponts, 6x2.5 hours).

- **Y. Roustan**, (responsible and teaching) Modélisation numérique de la pollution atmosphérique, M2 AIR du master Risque et Environnement, parcours Sciences et Génies de l'Environnement (Université de Paris - Université Paris Est Créteil – École des Ponts ParisTech).

- **Y. Roustan**, (co-responsible and teaching) Externalités des Transports, master TraDD (École des Ponts ParisTech).

- **Y. Roustan**, (teaching) Pollution de l'Air, master MISE (Université Gustave Eiffel – Ecole d'Ingénieur de la Ville de Paris - École des Ponts ParisTech).

- **Y. Roustan**, (teaching) Pollutions de fond et impacts écologiques des activités humaines, EGEDD (École des Ponts ParisTech).

- **B. Carissimo**, Introduction à la Météorologie, Cours d'ouverture, 1ère année École des Ponts ParisTech

Other schools and masters

- **Y. Roustan**, (teaching) Cours Qualité de l'air et Santé, 3e année, École Nationale des Travaux Publics de l'État.

- **M. Ferrand**, (teaching) Cours de Mécanique des Fluides - 2, École Normale Supérieure Paris Saclay (M2FESup Génie civil, 6x2-hour lectures).

- **K. Sartelet**, (teaching) Course on "Modelling Urban Pollution" in the Master "Urban Environment", École Centrale de Nantes (14 hours).

- **B. Carissimo**, "Air pollutant dispersion modeling", Master IMT Atlantique.

Outreach

- **K. Sartelet**, L. Menut, G. Forêt, Multi-scale modelling of air quality, IPSL Science Advisory Board, May 31st, June 1st 2022.

- **K. Sartelet**, "Comment le changement climatique impacte-t-il la qualité de l'air ?", Ingenius, Ecole des Ponts, Nov 2022, https://ingenius.ecoledesponts.fr/articles/comment-le-changement-climatique-impacte-t-il-la-qualite-de-lair/

Prize, honours, outstanding grants

- **L. Lugon**, Prix de thèse de l'Université Paris-Est, Ecole Doctorale SIE, 2022.